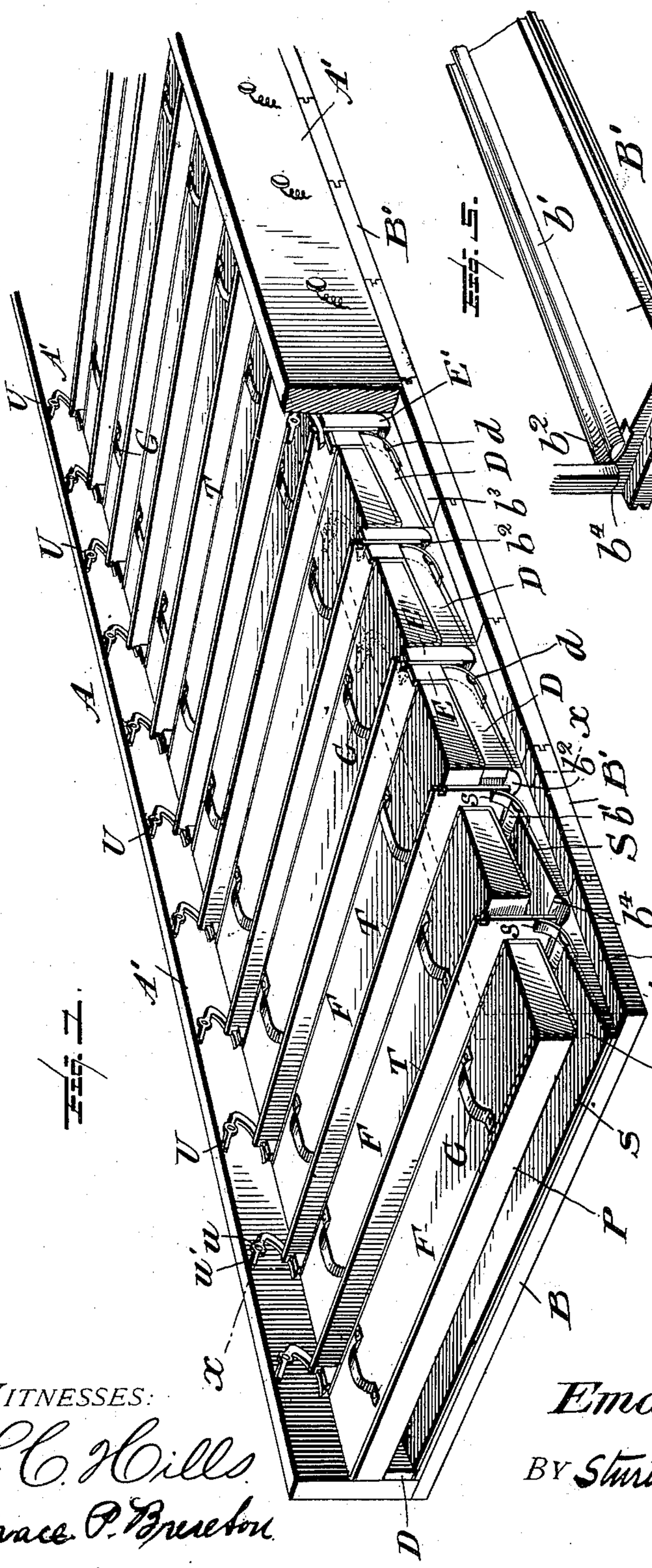
No. 662,286. Patented Nov. 20, 1900.

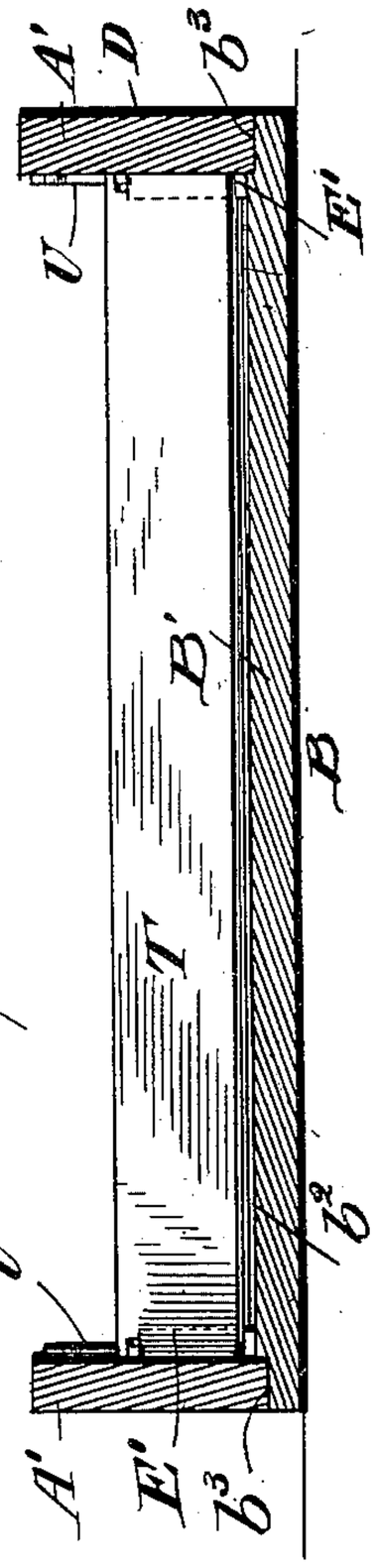
E. MOTZ.

ELECTROLYTIC APPARATUS.

(Application filed May 26, 1900.)

(No Model.) 2 Sheets—Sheet 1.





WITNESSES:

L. C. Hills

Grace P. Breeton

INVENTOR:

Emanuel Motz,

BY Sturtevant & Struby

Attorney

No. 662,286. Patented Nov. 20, 1900.

E. MOTZ.

ELECTROLYTIC APPARATUS.

(Application filed May 26, 1900.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 3.

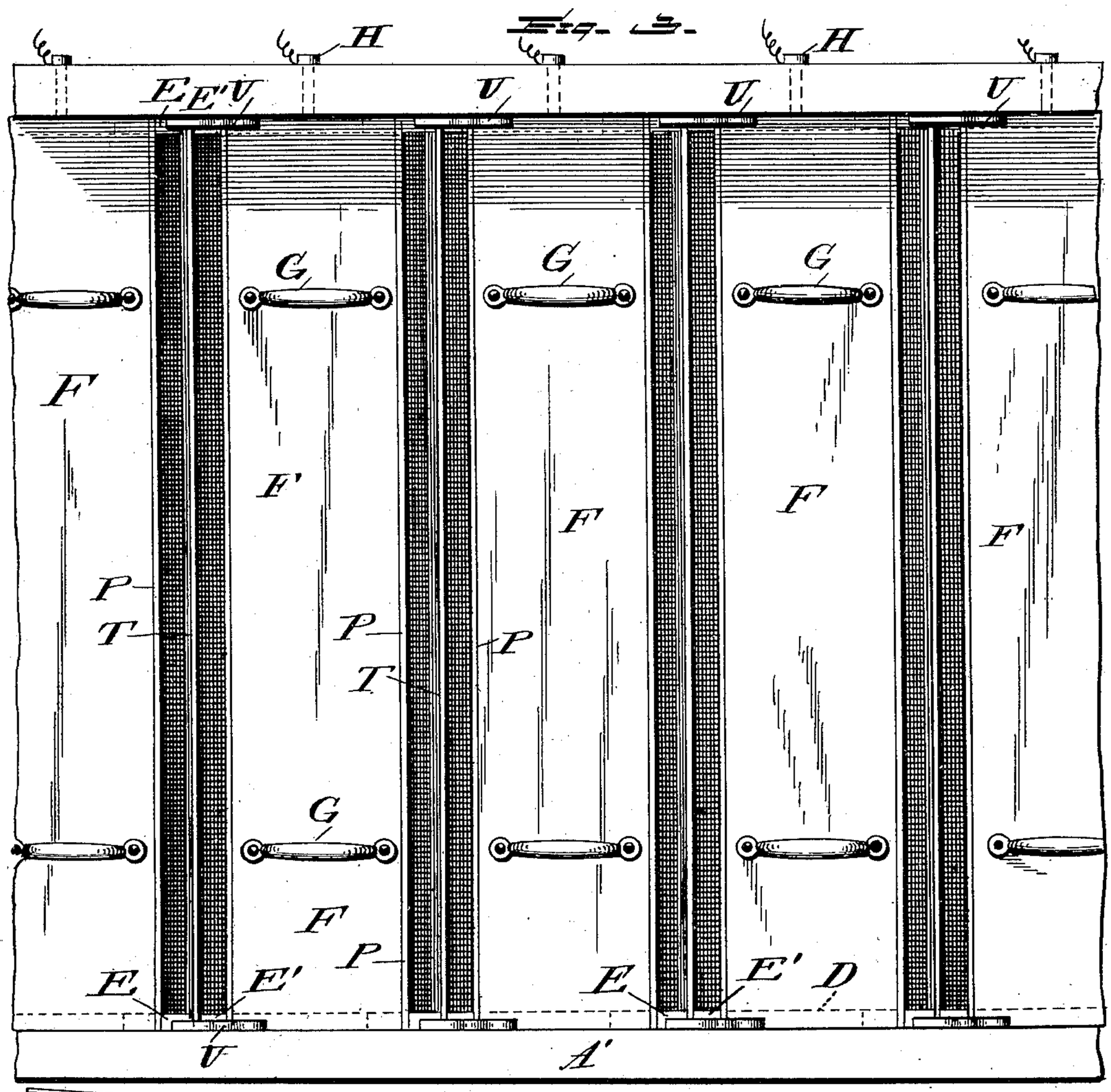
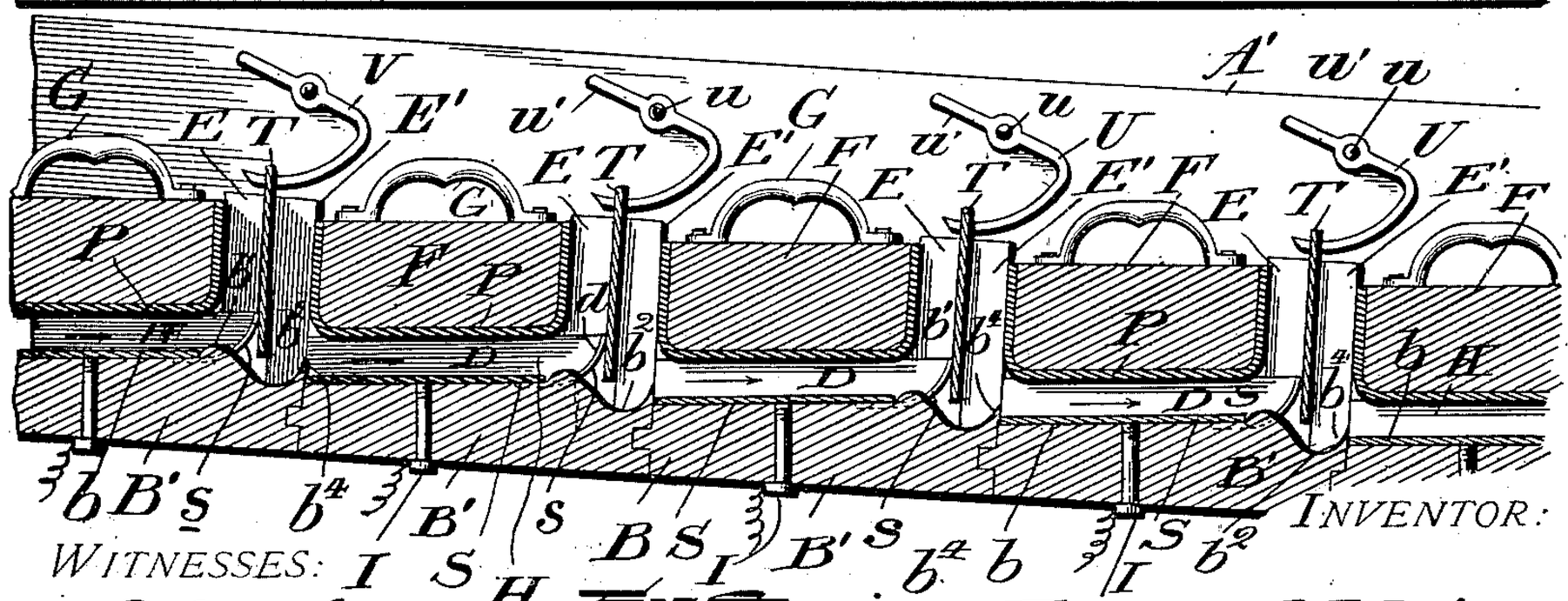


Fig. 4.



WITNESSES:
L. C. Hills
Grace P. Brereton.

INVENTOR:
Emanuel Motz,
BY Shillivant & Brady
Attorney

UNITED STATES PATENT OFFICE.

EMANUEL MOTZ, OF JEFFERSON, SOUTH CAROLINA.

ELECTROLYTIC APPARATUS.

SPECIFICATION forming part of Letters Patent No. 662,286, dated November 20, 1900.

Application filed May 26, 1900. Serial No. 18,129. (No model.)

To all whom it may concern:

Be it known that I, EMANUEL MOTZ, a citizen of the United States, residing at Jefferson, in the county of Chesterfield, State of South Carolina, have invented certain new and useful Improvements in Electrolytic Apparatus, of which the following is a description, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My improvement relates to electrolytic apparatus for the treatment of ores, particularly those of gold or other precious metal, to insure the separation of the metal from the ore; and it consists in the apparatus hereinafter described and shown, by which the ore after having been crushed and mixed with a solvent in solution is subjected to the action of an electric current and to agitation, whereby the larger particles of precious metal are deposited and amalgamated at once and the complete solution and deposition of the smaller particles are effected rapidly and thoroughly and at small cost, so that the material discharged from the apparatus will consist only of a solution which may be used again and the tailings from which the metal has been completely extracted.

In the accompanying drawings, Figure 1 is a perspective view of my improved apparatus, part of one side being broken away. Fig. 2 is a sectional view on the line x x of Fig. 1. Fig 3 is a plan view of the apparatus. Fig. 4 is a longitudinal section. Fig. 5 is a detail of one of the sections of the bottom; and Fig. 6 is a sectional view, on an enlarged scale, of a modified form of the vertical plate.

A represents a trough or flume having sides A′ A′ and bottom B. The sides A′ A′ are preferably made of ordinary plank laid lengthwise. The bottom B is made up of sections B′, flat on their under sides and on their upper sides cut to the form shown, so as to have the flat face b at an angle to the plane of the under side, the rib b', and the concavity b^2. These sections are rabbeted at b^3, so as to fit tightly the sides A′ A′, to which they are secured by any convenient means. The bottom sections B′ are joined together, so as to form a liquid-tight bottom.

While I contemplate making each of the bottom sections B′ in one piece, it is evident that each of these sections may be made in two or more pieces, if desired, it being essential only that each bottom section be capable of being tightly joined to the sides A′ A′ and to adjoining sections and have on its upper face the flat portion b, the rib b', and the concavity b^2.

Secured to the sides A′ A′ and preferably resting on the bottom B are strips D, preferably of wood, each extending nearly the full length of a section B′ and terminating about the middle of the concavity b^2, where it is cut away, as shown at d. Resting on this end of the strip D and secured to the sides A′ A′ are upright strips E E, preferably of wood. Parallel with these strips E E and separated from them by a slight interval are upright strips E′ E′, also secured to the sides A′ A′, but extending down to and resting on the bottom B.

The interval between strips E and E′ forms a groove or slot adapted to receive and support the ends of an upright metallic plate T. This plate T may be of copper; but I prefer to use an iron plate covered with lead-foil amalgamated, which when it has received a sufficient deposit may be stripped off and the precious metal recovered therefrom. On the flat portion b of each section B′, which by reason of the rib b' at one end and the upwardly-projecting end b^4 of the preceding section B′ at the other end is, in effect, a recess, is placed a metallic (preferably copper) plate S of substantially the length of the recess, and consequently of a length less than that of the section B′, though extending transversely from side to side of the flume. This plate may be previously amalgamated or a small quantity of mercury may be placed in the recess with it. The plate S is electrically connected with the upright plate T by a metallic strip s, preferably arranged under the cut-away end of strip D, this strip being soldered or otherwise fastened at its lower end to plate s and at its upper end being held firmly against plate T, so as to make contact therewith, while permitting it to be raised or lowered. The metallic plate S is connected with a battery or dynamo by set-screw I, and, with the upright plate T, to which it is electrically connected by strip s, as described, forms the cathode-plate of my device.

On the strip D and substantially filling the space between the upright strips E′ and E is placed a cross-bar F, having its bottom and sides covered with a sheet of metal P, preferably lead. This metallic sheet is connected with the battery or dynamo by means of a screw H′ and forms the anode-plate of my device. There is thus formed between the plate S and the bottom of plate P a substantially horizontal passage H. The cross-bar F is provided with handles G, so that it may be readily lifted out of and returned to its place. The strips D and E and E′ serve to hold this anode-plate at a fixed distance from the cathode-plates S and T.

The upright plate T is arranged to be capable of being raised or lowered in the groove or slot formed, as above described, between the upright strip E and E′. Eccentric hooks V, pivoted to the sides A′ A′ at *u* and having handles *u′*, engage recesses in the ends of the upright plate T and form a convenient means for adjusting the height of the plate. In use the lower edge of the plate T will extend downward below the plane of the bottom of the anode-plate and in line with the passage between the plates S and P. It may even extend below the plane of the plate S.

My improved trough or flume is preferably constructed in sections, each comprising twelve bottom sections B′ and a corresponding number of plates S, upright plates T, and cross-bars F, thus forming twelve electrolytic cells; but I do not limit myself to any particular number of these cells in a section. As many of these sections of twelve cells as desired may be used, and they may be arranged in one line or may be arranged in parallel lines, as found most convenient. The trough or flume is placed at such an inclination that the plates S will be substantially in a horizontal plane, each plate S being on a level slightly lower than the corresponding plate in the preceding cell. By this arrangement the pulp—that is, the pulverized ore mixed with the solvent used—will flow by gravity in the directions indicated by the arrows, Fig. 4, from one end of the flume to the other.

In each cell the pulp will pass through a passage formed by the cathode-plate S, the anode-plate P, and the strips D, and passing over the rib *b′* will descend in the concavity b^2, where it comes in contact with the upright plate T. The inclination of the concavity b^2 is such that the pulp acquires at this point such velocity that by coming in contact with the upright plate T it is agitated to an extent depending upon the position of this plate. By means of the eccentric hooks V the height of the plate T may be regulated, thus regulating the agitation of the pulp.

As electrical current is constantly passing between the anode-plate P and the cathode-plates S and T, the action of the solvent upon the particles of gold or other metal contained in the pulp will be largely increased. At the same time the gold is deposited on the cathode-surfaces S and T either by its own weight or by electrolytic action, and may at any time be recovered without interfering with the operation of the apparatus. By means of the handles G the cross-bars F, carrying the anode-plates, may be lifted out, permitting ready access to the cathode-plates for the purpose of removing the gold deposited on them or for other purposes.

The agitation effected by the upright plate T, acting with the concavity in the bottom section B′, will have the effect of bringing a fresh portion of the pulp in contact with the anode-plate P of the succeeding cell, where it will be in the zone of most intense electrical and chemical action. The number of cells employed will be such that before the material leaves the flume every portion of the pulp will have been caused to pass repeatedly through this zone of most intense action. As a consequence, before the pulp leaves the flume it will be completely exhausted of the gold originally contained in it, and it will only remain to separate the solution from the worthless material, which may be done by permitting the worthless material to settle, drawing off the solvent solution, and returning it to a tank to be used again.

By lifting out one of the cross-bars F by means of the handles affixed to it access may be readily had to the cathode-plate beneath it for the purpose of removing the particles of gold adhering to it or for any other purpose without interfering with the operation of the remaining cells of the apparatus.

The cathode-plates S and T being, as shown, flat plates without bends or curves, they can be readily cut from sheets of copper or other sheet metal and cost practically nothing beyond the cost of the material.

The apparatus throughout is simple in construction, and with the exception of the bottom sections B′, which should be cut to form in a molding-machine, all its parts may be made and the apparatus put together ready for operation by any carpenter of ordinary skill.

While I prefer to use a copper cathode-plate S, as described, this is not absolutely necessary to the operation of my apparatus and such plate may be dispensed with; but in such case I fill the recess in the bottom section B′ with mercury. In such case the mercury acts as a cathode-plate and also amalgamates the particles of gold brought into contact with it.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an electrolytic apparatus, the trough or flume having the longitudinal sides provided with terminals for making contact with an anode-plate, and the bottom made up of sections, each having on its upper face, a flat portion at an angle to the plane of the lower face adapted to receive a metallic plate, a

transverse rib at the end of the flat portion, and a concavity on the other side of the rib extending below the plane of the flat portion, each bottom section being provided with a terminal for making contact with the metallic plate; substantially as described.

2. In an electrolytic apparatus, the trough or flume having the longitudinal sides provided with terminals for making contact with an anode-plate and the bottom made up of sections, each having on its upper face a flat portion at an angle to the plane of the lower face adapted to receive a metallic plate, a transverse rib and concavity at the end of the flat portion, each bottom section being provided with a terminal for making contact with the metallic plate; strips secured to the sides above the bottom sections and adapted to support a cross-bar, upright strips also secured to the sides and receiving between them and supporting an upright metallic plate in line with the concavity; substantially as described.

3. In an electrolytic apparatus, a cell having open ends and having a transverse concavity in its bottom comprising a horizontal cathode-plate of less length than the cell, resting on the bottom of the cell, an upright cathode-plate in circuit therewith and extending downward into the concavity in the bottom of the cell, an anode-plate supported above and with a portion thereof substantially parallel with the horizontal cathode-plate and at a fixed distance from the horizontal and upright cathode-plates; substantially as described.

4. In an electrolytic apparatus a cell having open ends and having a transverse concavity in its bottom comprising a horizontal cathode-plate of less length than the cell resting on the bottom of the cell, an upright cathode-plate in circuit therewith and extending downward into the concavity in the bottom of the cell, an anode-plate supported above and with a portion thereof substantially parallel with the horizontal cathode-plate and at a fixed distance from the horizontal and upright cathode-plates, and means for adjusting the height of the upright cathode-plate; substantially as described.

5. In an electrolytic apparatus, a series of cells, having open ends each having a transverse concavity in its bottom, and each comprising a horizontal cathode-plate of less length than the cell resting on the bottom of the cell, an upright cathode-plate in circuit therewith and extending downward into the concavity in the bottom of the cell, an anode-plate supported above and with a portion thereof substantially parallel with the horizontal cathode-plate and at a fixed distance from the horizontal and upright cathode-plates, the cells being so arranged that the horizontal cathode and anode plates of each cell shall be at a lower level than the corresponding plates of the preceding cell; substantially as described.

6. In an electrolytic apparatus, a series of cells, having open ends each having a transverse concavity in its bottom and each comprising a horizontal cathode-plate of less length than the cell resting on the bottom of the cell, an upright cathode-plate in circuit therewith and extending downward into the concavity in the bottom of the cell, an anode-plate supported above and with a portion thereof substantially parallel with the horizontal cathode-plate and at a fixed distance from the horizontal and upright cathode-plates, and means for adjusting the height of the upright cathode-plate, the cells being so arranged that the horizontal cathode and anode plates of each cell shall be at a lower level than the corresponding plate of the preceding cell; substantially as described.

7. In an electrolytic apparatus, the combination with a series of open-ended cells, each comprising a cathode and anode plate, so arranged as to form a substantially horizontal passage between them, of an upright cathode-plate interposed between the end of the horizontal passage of one cell and the entrance of the succeeding cell and arranged to more or less obstruct the free flow of pulp from one cell to another and to thus agitate the pulp; substantially as described.

8. In an electrolytic apparatus, the combination with a series of open-ended cells, each comprising a cathode and anode plate, so arranged as to form a substantially horizontal passage between them, of an upright plate between the end of the horizontal passage of one cell and the entrance of the succeeding cell, and means to adjust the height of the upright plate, so as to more or less obstruct the free flow of pulp from one cell to another and thus agitate the pulp; substantially as described.

9. In an electrolytic apparatus, the combination with a series of open-ended cells, each comprising a cathode-plate and an anode-plate so arranged as to form a substantially horizontal passage between them, the anode-plate having also upright ends, of an upright cathode-plate arranged between the anode-plates of succeeding cells and extending below the plane of the horizontal portion of the anode-plate, so as to more or less obstruct the flow of pulp from one cell to another, and to thus cause an agitation of the pulp and at the same time subject it to electrolytic action; substantially as described.

10. In an electrolytic apparatus, the combination with a series of open-ended cells each comprising a cathode-plate and an anode-plate, so arranged as to form a substantially horizontal passage between them, the anode-plate having also upright ends, of an upright cathode-plate arranged between the anode-plates of succeeding cells and extending below the horizontal portion of the anode-plate, and means for adjusting the height of the upright cathode-plate, so as to more or less obstruct the flow of pulp from one cell to another

and to thus agitate the pulp and at the same time subject it to electrolytic action; substantially as described.

11. In an electrolytic apparatus, an open-ended cell comprising a bottom having a flat portion, a transverse rib and a concavity, sides having horizontal supporting-strips, and upright strips secured thereto, a cathode-plate resting on the flat portion of the bottom, an anode-plate carried by a cross-bar provided with handles, and resting on the horizontal supporting-strips, an upright cathode-plate movably held between the upright strips secured to the sides, and means for adjusting the upright cathode-plate; substantially as described.

12. In combination with an electrolytic cell having open ends and having a horizontal cathode-plate resting on its bottom, and an upright cathode-plate in circuit therewith, of an anode-plate carried by a removable cross-bar and having a horizontal and upright portion, so arranged that the horizontal portion is parallel with the horizontal cathode-plate and the upright portion is parallel with the upright cathode-plate; substantially as described.

13. In an electrolytic-cell having open ends, the combination with a removable cross-bar and means for supporting it in position, of a metallic plate covering the bottom and two sides of the bar, and forming the anode-plate of the cell, of a metallic plate arranged horizontally below and parallel with the bottom of the cross-bar, so as to form a passage between such plate and the bottom of the cross-bar, such plate forming a cathode-plate of the cell, and an auxiliary metallic cathode-plate arranged vertically and parallel with the sides of the cross-bar and in circuit with the horizontal cathode-plate, such vertically-arranged plate extending below the plane of the bottom of the cross-bar, so as to more or less obstruct the said passage; substantially as described.

14. In an electrolytic apparatus comprising a series of open-ended cells, the combination of the anode-plate carried by a cross-bar removably supported at a distance above the bottom of the cell, a cathode-plate, resting on the bottom of the cell, the bottom being provided with a rib b' and a concavity b^2, and a metallic cathode-plate adjustably supported above said concavity, and in circuit with the horizontal cathode-plate; substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

EMANUEL MOTZ.

Witnesses:
GEO. W. GREGORY,
J. A. BAKER.